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(71) Applicant: The Wiggins Teape Group Limited
P.O. Box 88 Gateway House Basing View
Basingstoke Hampshire RG21 2EE (GB)

(72) Inventor: Sinclair, Peter
Glenside London Road East
Amersham Buckinghamshire HP7 9DH (GB)

(74) Representative: Farwell, William Robert et al
PHILLIPS & LEIGH 7 Staple Inn Holborn
London WC1V 7QF (GB)

(54) Security and decorative paper.

(57) Security or decorative paper is provided incorporating plastics polymer film in the form of planchets divided from a laminate of the film and a cellulosic fibre substrate, the planchets being incorporated in the paper stock in manufacture of the paper whereby the fibres of the substrate are united with the fibre structure of the paper web.

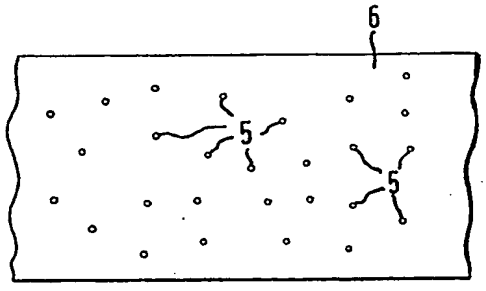

FIG.3

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Description

SECURITY AND DECORATIVE PAPER

The invention relates to security and decorative paper.

There are numerous ways of making paper difficult and expensive to counterfeit and readily identifiable as to source, but new techniques for keeping ahead of counterfeiters' ingenuity are always sought, particularly as reprographic and printing methods improve.

Films of plastics showing visible surface effects for example iridescence, fluorescence, reflectivity or light polarisation, are commercially available for use in decorative packaging/display materials. Such film is, for example, laminated to board to produce fancy soap cartons. We have seen that if it could be satisfactorily incorporated in paper, for example as small punched elements or planchets, such film would be of value in a security context. The visible surface effects would be difficult or impossible to reproduce by printing or reprography, thus preventing ready counterfeiting. Moreover, they do not reproduce at all on a monochrome xerographic copier. Thus photocopies of documents, known only to be printed on material containing film exhibiting such effects when genuine, would be immediately identifiable as being fraudulent. In addition such paper would produce a novel decorative effect. Even without the use of film showing visible surface effects a paper difficult to counterfeit would be obtained.

Polymeric films such as those of polyester cannot as such be incorporated into paper in any secure way in view of their incompatibility with cellulose. Because of this, planchets incorporated into papermaking stock are found to detach readily from the resulting paper. Not only therefore do they have little security value, but they can interfere with the quality of a printed image if they detach from areas which have been overlaid by printing.

The invention lies in a way of using plastics polymer film successfully in a security or decorative paper. This involves laminating the film to a cellulosic fibre substrate, before dividing the laminate by punching or other convenient method, to form planchets which are then incorporated in a papermaking stock. The planchets are conveniently circular but any shape compatible with incorporation in a papermaking stock may be used. This stock can be used to produce security or decorative paper in which the fibres of the cellulosic component of each planchet are firmly united with the fibre structure of the security paper web.

Desirably, the cellulosic substrate is a wet-strength tissue paper.

Depending on the process used to produce a particular visible surface effect on a film, and the lamination process used, the surface effect may be conferred on the film before or after lamination to the cellulosic substrate.

Thus, for example, in the case of an iridescent film, which is formed from a multiplicity of very thin thermoplastic layers, lamination may be effected either by applying the first layer to the substrate and then progressively applying further layers. Alternatively, the already formed multilayer film may be laminated to the substrate using an adhesive. However, heat lamination is not preferred in this context, since heating of the film to the temperature necessary to achieve bonding to cellulose is likely cause serious deterioration in the visual surface effect.

Similar heat lamination problems may occur with fluorescent films and films exhibiting light polarisation effects, and the use of adhesives for achieving lamination is preferred.

Reflective surfaces are generally produced by forming a vacuum metallized layer on a high gloss plastics film, applying an adhesive to the metallized surface, applying a substrate to the adhesive coated surface and, after the adhesive has cured, stripping the plastics film from the laminate to expose a reflective coating formed by the transferred metallized layer.

The vacuum metallized layer may be adhered directly to the cellulose substrate during the transfer process, or to a polymeric film. In the latter case, the film is then laminated to the cellulosic substrate using heat or an adhesive.

Desirably, where the polymer film is a polyester and adhesive is to be used the polyester is co-extruded with an acrylic plastics film on at least the surface which is to be laminated to the cellulosic substrate. The acrylic material promotes adhesion, with the aid of a suitable adhesive, to the substrate.

Many suitable adhesives exist, the primary requirement being that the bond formed between the film and the substrate is water resistant. Preferably, polymeric adhesives are used, for example vinylacetate/ethylene copolymer adhesive, acrylic emulsion adhesive, or two-component acrylic/modified polyamino amide adhesive.

It has been found that under certain circumstances, (for example when the security paper is calendered) adhesive may migrate from the planchets and locally transparentise the sheets in the region around each planchet. To overcome this problem where found, a pigment such as titanium dioxide can be added to the adhesive. This has been found to maintain the opacity of the security paper satisfactorily even after calendering.

To effect lamination of the film to the cellulosic substrate where an adhesive is used, adhesive can be applied either to the film or to the substrate, before lamination. Lamination is effected with the adhesive in either the wet or dry state depending on the nature of the adhesive used. The particular process of lamination does not however form part of the invention, except in so far as a water resistant bond must be formed.

The invention is illustrated in the accompanying drawings in which:-

Figure 1 is an enlarged side view of a laminate from which planchets are cut for use in

accordance with the invention.

Figure 2 shows a number of planchets cut from a laminate of the kind shown in Figure 1, and

Figure 3 shows a sheet of paper made from paper making stock to which planchets of the kind shown in Figure 2 have been added.

Referring first to Figure 1, the laminate shown comprises a cellulosic substrate 1, typically high wet strength waterleaf tissue paper, to which a film 2 is laminated by means of an adhesive layer 3. The film 2 exhibits a desired visible surface effect, for example iridescence, fluorescence, reflectivity or light polarization.

By means of a punch 4, planchets 5 (shown in Figure 2) are cut from the laminate of Figure 1. The planchets 5 are added to paper making stock from which a paper sheet 6 (shown in Figure 3) is formed, the planchets 5 being distributed throughout and well bonded into the sheet.

The elements divided from the film/cellulosic laminate can be of any shape, for example, square, circular, hexagonal, star shaped or irregular. The elements may for example be in the range of from 0.1 to 10 millimetres (maximum dimension) in size and are preferably between 0.5 to 2 millimetres maximum dimension. The amount of the elements added to the security paper stock may for example be from 0.02 to 10% and is preferably from 0.1 to 1% of the total weight of solids in the stock.

The elements can be added to any conventional papermaking stock, for example furnishes based on bleached/unbleached chemical wood pulp, bleached/unbleached mechanical wood pulp, bleached/unbleached semi-chemical wood pulp, cotton rag pulp or cotton linters or any combination of the foregoing.

To increase distinctiveness, the paper substrate may be coloured by the use of pigments or dyes or may incorporate other distinctive elements such as 'Silurian' (Trade Mark) fibres.

The invention is further illustrated by the following Examples using polyester film, preferred for its high melting point. Numerous other suitable films are however known, for example from the U.S. Patent Specification referred to in Example 1, and are on the market.

Example 1

'Mearl' (Trade Mark) Type 5121 iridescent multilayer polymeric film made as described in U.S. Patent No. 3442755 from polyester film co-extruded with acrylic polymer at each surface and having a total thickness of 20 microns, was laminated to a 32 g/m² high wet strength waterleaf tissue using 'Crodafix' (Trade Mark) 27-14500 vinylacetate/ethylene copolymer adhesive at a coatweight of 3 g/m². The resulting laminate was punched to produce circular planchets 1.6 millimetres in diamet r. A papermaking furnish was then prepared comprising 60% bleach d sulphate hardwood and 40% bleached sulphate softwood pulp to which was added 0.5% by weight of rosin, 1% by weight of alum and 0.2% by weight of the laminated planchets. Laboratory handsheets were produced from the foregoing furnish and run through a size press which applied a 7.5% solution of starch, 'Amylofax 10' (Trade Mark) made by Tunnel Avebe.

The resulting sheets, when dried, showed a striking effect with the iridescent planchets plainly visible at the surface of the paper. The planchets at the surface adhered strongly to the body of the sheet and were not easily detached.

Example 2

The procedure of Example 1 was repeated and differed only in that the adhesive used to form the laminate was that sold under the trade name 'Datac 843' - an acrylic emulsion based adhesive which can be applied in the coatweight range 3 to 12 g/m² (dry). The preferred dry coatweight is 3 g/m². The results in terms of planchet adhesion accorded closely with those of Example 1.

Example 3

The process of Example 1 was repeated, and differed only in that the adhesive used to form the laminate was that sold under the trade name 'Crown Nubond Four' - a two-component acrylic-modified polyamino amide adhesive. This adhesive can be applied in the coatweight range of 4-24 g/m² and the preferred coatweight is 4 g/m². The results in terms of planchet adhesion accorded closely with those of Example 1.

Example 4

Example 2 was repeated after the addition to the adhesive of a conventional titanium dioxide pigment (sold under the trade name 'Tioxide AHR') in an amount equivalent to 20% by weight of the adhesive solids. After the handsheets had been passed through a size press and dried, they were calendered. It was noted that the presence of the titanium dioxide did not affect the strength of the adhesive bond and that no transparentising of the sheets adjacent to the planchets had occurred.

Example 5

The procedure of Example 3 was repeated, but with the addition to the adhesive of titanium dioxide (sold under the trade name 'Tioxide AHR') in an amount equivalent to 20% by weight of the adhesive solids. After the handsheets had been passed through a size press and dried, they were calendered. It was found that the presence of the titanium dioxide did not affect the strength of the adhesive bond and that calendering did not affect the opacity of the sheets in the region of the planchets.

Example 6

Metallized thermoplastics film 38 microns in thickness and sold by Roseo Ltd. under Trade Name "Metallic Silver Mirror 3925", was laminated to a high wet strength waterleaf tissue having a substance of 32 g/m^2 using as adhesive a vinyl acetate copolymer dispersion sold under the Trade Mark "Vinamul 3231" by Vinamul Ltd. at a coatweight of 10 g/m^2.

The laminate thus produced was converted by punching into planchets 1.6 mm in diameter and added to a papermaking stock (80% hardwood/ 20% softwood mixture) at a level of 1% by weight of the pulp.

Laboratory handsheets were made from the stock and treated in a laboratory size press with a 10% polyvinyl alcohol solution to promote retention of the planchets in the sheet.

Inspection of dried handsheets showed that the planchets were well bonded into the body of each sheet.

Claims

1. Security or decorative paper incorporating plastics polymer film in the form of planchets divided from a laminate of the film and a cellulosic fibre substrate, the planchets being incorporated in the paper stock in manufacture of the paper whereby the fibres of the substrate are united with the fibre structure of the paper web.

2. Paper according to claim 1 wherein the polymer film shows iridescent, fluorescent, reflective, light-polarising or other visible surface effect.

3. Paper according to claim 1 or 2 wherein the polymer film comprises a polyester co-extruded with an acrylic polymer enhancing bonding of film and substrate by a water-resistant adhesive.

4. Paper according to any preceding claim wherein film and substrate are united by an adhesive containing an opacifying pigment.

5. Paper according to any preceding claim wherein the substrate is a wet-strength tissue paper.

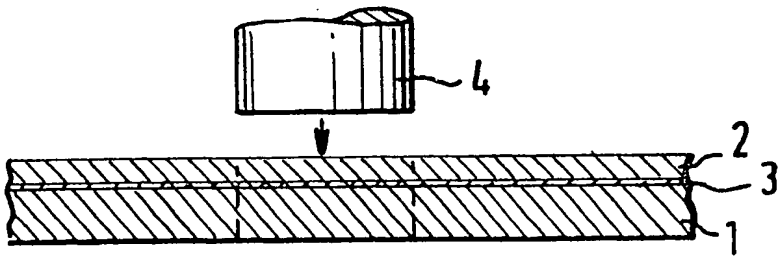

FIG.1

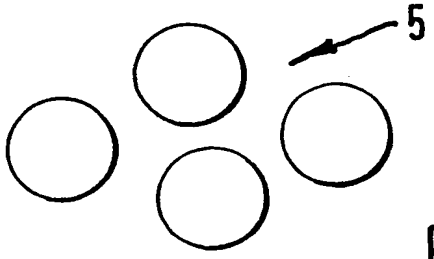

FIG. 2

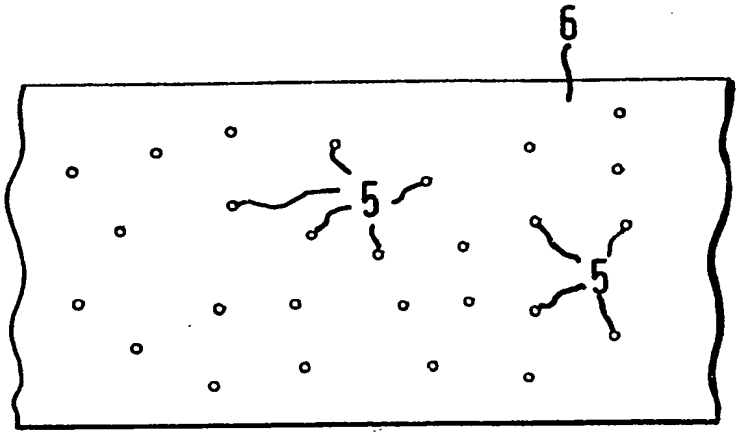

FIG.3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 4941

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-2 034 232 (W.H. GROGAN et al.) * Page 1, column 1, lines 1-36 *	1	D 21 H 5/10 D 21 H 5/02
A	US-A-4 652 015 (T.T. CRANE)		
A	FR-A-2 478 695 (P.P. ROSET)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

D 21 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-09-1989	SONGY O.M-L.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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